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LISTING OF THE CLAIMS

1. (Currently Amended) A superconducting magnet system comprising:
  - (A) a superconducting magnet and a cryogenic shield for providing cooling to the superconducting magnet;
  - ~~(B) a cryocooler positioned to provide refrigeration to the cryogenic shield;~~
  - (CB) a cryogen vessel containing liquid cryogen; and
  - (DC) a heat pipe extending from the cryogen vessel to the cryogenic shield, the heat pipe having a wall structure and a working fluid, the wall structure configured such that the working fluid wicks in the wall structure to effect heat transfer from the cryogenic shield to the liquid cryogen within the cryogen vessel thereby to provide further cooling, independently of the cryocooler, from the liquid cryogen within the cryogen vessel to the cryogenic shield;
  - (D) a cryocooler in contact with the cryogenic shield but not the cryogen vessel to provide refrigeration directly to the cryogenic shield and therefore the superconducting magnet and indirectly to the liquid cryogen within the cryogen vessel through the heat transfer effected within the heat pipe between the cryogenic shield and the liquid cryogen such that when the cryocooler is operating boil-off of the liquid cryogen is prevented by subcooling the liquid cryogen within the cryogen vessel through the heat pipe and when the cryocooler is not operating the heat transfer from the cryogenic shield to the heat pipe will evaporate the liquid cryogen within the cryogen vessel to provide shield cooling and therefore, the cooling to the superconducting magnet.
2. (Original) The superconducting magnet system of claim 1 wherein the superconducting magnet is immersed in liquid helium.
3. (Original) The superconducting magnet system of claim 1 wherein the cryogenic shield comprises a plurality of layers, including an innermost layer closest to the superconducting magnet and an outermost layer furthest from the superconducting magnet.

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4. (Original) The superconducting magnet system of claim 3 wherein the cryogenic shield comprises three layers.

5. (Original) The superconducting magnet system of claim 3 wherein the cryocooler is positioned to provide cooling to each of the layers of the cryogenic shield.

6. (Original) The superconducting magnet system of claim 3 wherein the heat pipe extends to the outermost layer of the cryogenic shield.

7. (Original) The superconducting magnet system of claim 1 further comprising means for providing refrigeration from the cryocooler to the cryogen vessel.

8. (Original) The superconducting magnet system of claim 7 wherein the means for providing refrigeration from the cryocooler to the cryogen vessel comprises a bus bar.

9. (Original) The superconducting magnet system of claim 1 wherein the heat pipe is in fluid communication with the cryogen vessel.

10. (Original) The superconducting magnet system of claim 1 wherein the heat pipe includes an upper heat exchange surface which is in direct heat exchange relation with the cryogen vessel.